Feb. 2, 1932. R. D. PIKE ET AL 1,843,336

NONOXIDIZING HEATING FURNACE

Filed March 18, 1930 2 Sheets-Sheet 1

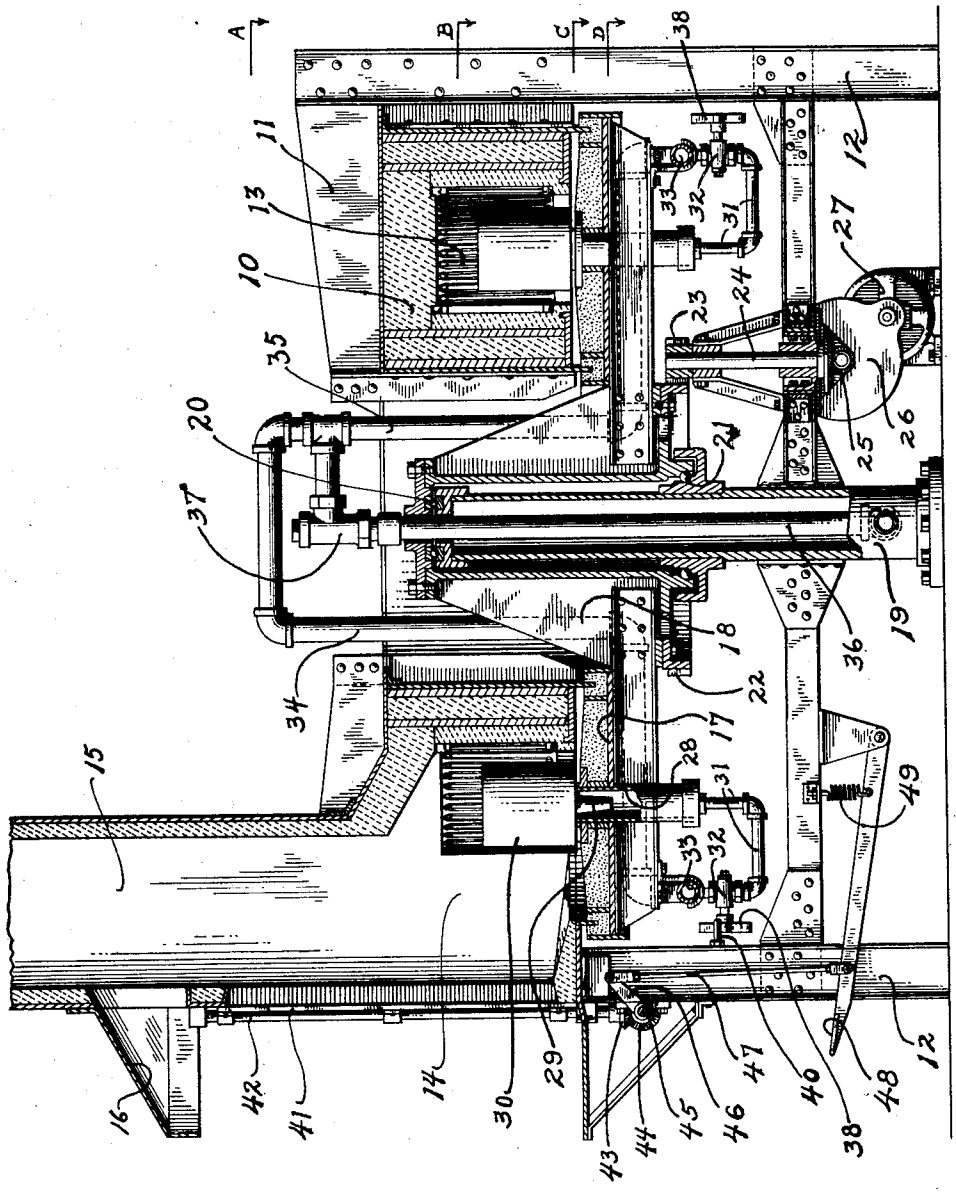


Fig. 1.

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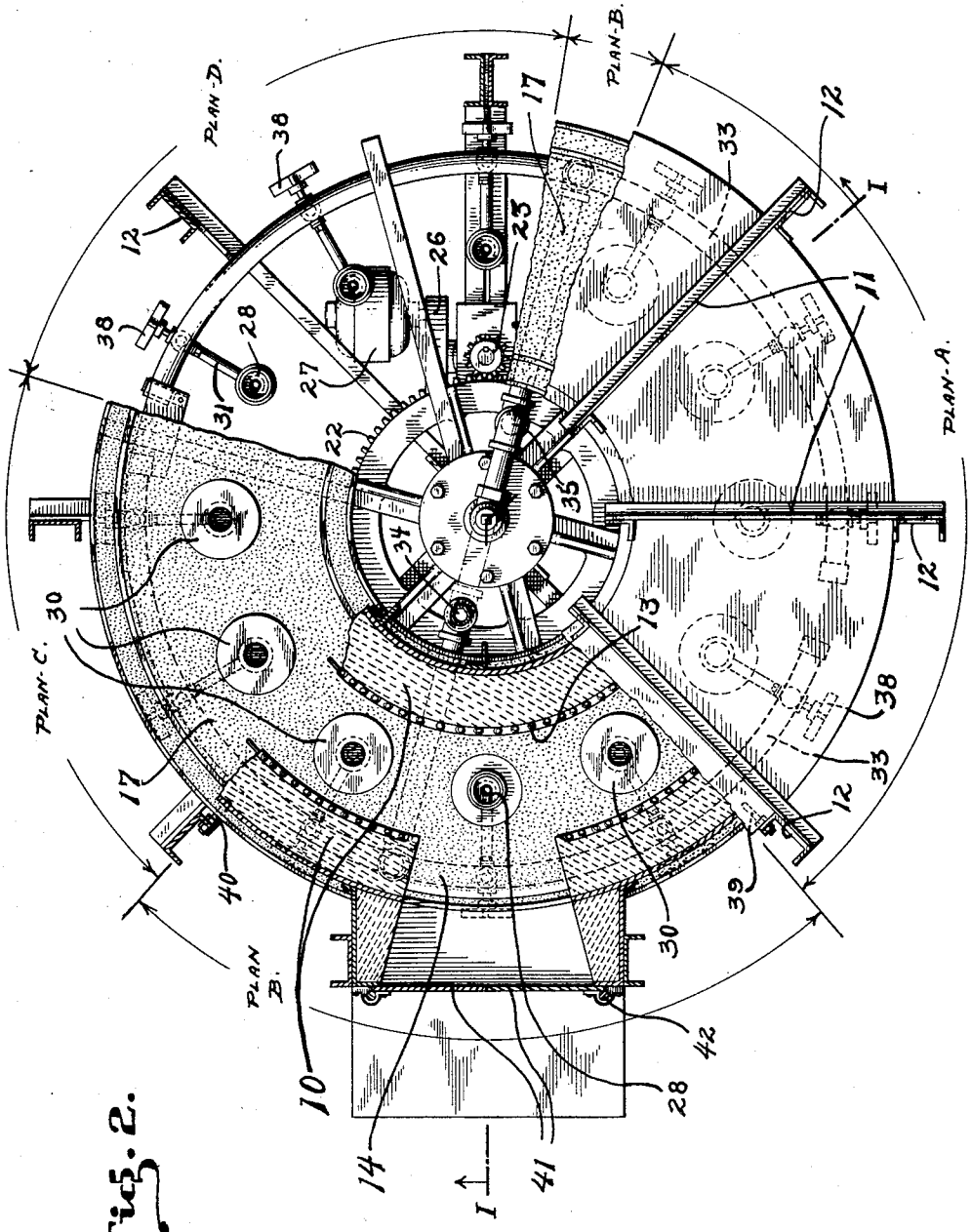


Fig. 2.

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UNITED STATES PATENT OFFICE

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NONOXIDIZING HEATING FURNACE

Application filed March 18, 1930. Serial No. 436,746.

Our present invention relates to a heating furnace for heating articles in a non-oxidizing atmosphere and more particularly to a furnace for the pre-heating of parts in combination with which other metals are to be cast.

An object of our invention is to provide a continuously acting furnace for heating various articles used in industrial pursuits which articles must be maintained free of oxidation during the heating operation.

Another object of our invention is to provide a continuously acting furnace of novel construction in which a non-oxidizing atmosphere may be maintained in a novel and effective manner.

A further object is to provide in a furnace of the above type a means for controlling the admission of a non-oxidizing gas thereto which will prevent an unnecessary waste of the gas.

A further and more particular object of our invention is to provide a furnace for the preheating of the so-called centrifugal molds such as are disclosed in a prior application filed March 9, 1929, by Robert D. Pike, and identified in the Patent Office as Serial Number 345,705.

In the art to which our invention pertains, namely—that of casting an alloy upon a precast metallic backing or support, it is required that the backing or support be preheated to a predetermined temperature and at the same time be maintained free of oxidation. By way of further explanation it may be stated that we have for the purpose of facilitating an understanding of our invention illustrated and described apparatus suitable for the heating of the so-called centrifugal casting molds disclosed and described in the aforementioned prior application of Robert D. Pike. These molds are cylindical in shape and are adapted to be disposed and rotated above the vertical axis, each of the molds being provided with a downwardly projecting tapered shank which cooperate with a suitable spinning apparatus.

These molds are adapted to receive and support a precast metallic backing member or support in which is cast a lining of a suitable alloy for the purpose of providing a bearing lining therein.

The tapered shanks of these molds are provided with a central opening through which a suitable reducing gas may be introduced in the mold during the casting operation, all as described in the above referred to prior application.

Prior to the casting of the lining into molds of the above type, it is desirable that the mold, together with its contained backing member be preheated to a predetermined temperature and free of oxidation so that when the alloy is cast therein there will be effected a firm bond or weld between the parts.

In order to provide a furnace for the preheating of molds of the above character and other like articles which it is desired to maintain free of oxidation during the heating operation we propose to construct a furnace which may be continuously operated to carry the articles to be heated through a suitable heating furnace chamber. Our furnace is also provided with means for introducing a non-oxidizing gas into the furnace at various points, so as to maintain a non-oxidizing atmosphere within the furnace during the heating operation.

In the particular embodiment of our invention to be hereinafter described, we have provided an inverted annular type of furnace body having suitable heating means contained therein and at the bottom of this inverted furnace chamber we provide a rotatable annular table in which there is formed a plurality of pots or wells that are adapted to receive the depending shanks of the above referred to molds. These pots or wells are so constructed that they support the molds in such a manner that the reducing gases introduced in the furnace will pass through the interior of the molds. This is accomplished by providing a gas connection with each of the pots or wells through which the non-oxidizing gas may flow while the furnace bottom is in motion.

For the purpose of describing our invention we have illustrated in the accompanying drawings a furnace of the annular type.

We desire, however, to have it understood that our invention is not limited to a furnace of this construction as it is conceivable that our invention might well be embodied in furnaces of other types.

In the drawings wherein like numerals refer to like parts,

Fig. 1 is a developed vertical sectional view taken along line I—I of Fig. 2.

Fig. 2 is a fragmentary sectionalized plan view showing the parts broken away at different elevations around Fig. 1.

For a better understanding of our invention, we will now describe its construction in connection with the accompanying drawings, describing first the furnace structure, then the gas feeding apparatus, and finally some of its more important details and method of operation.

Furnace structure

In the drawings the furnace proper is shown as comprising an inverted annular chamber 10 constructed of refractory material. This inverted furnace chamber, as shown, is supported upon a suitable cantilever type of frame work 11 carried by suitable vertical legs 12. Arranged within the furnace chamber 10 there are provided suitable electric heater units 13 which when energized heat the furnace to the desired temperature. At one point in the annular furnace chamber we provide a suitable opening 14 through which articles may be placed into and removed from the furnace, and immediately over this opening 14 we also provide a suitable flue 15 by means of which the gases to be hereinafter referred to are allowed to escape from the furnace. Associated with this flue we also provide a suitable cowl 16 which functions to pick up any gases in the vicinity of the opening when the doors to be hereinafter described are opened. Cooperating with the bottom edges of the inverted furnace chamber 10 we provide an annular rotatable table-like bottom 17 which is adapted to rotate with respect to the remaining portion of the furnace. This bottom 17 is supported upon a suitable framework 18 which is in turn carried by a central pedestal 19. The pedestal 19 is as shown provided with suitable ball races 20 and 21 which provide a freely operating support for the table 17. Adjacent to the ball race 20 the framework 18 is provided with a suitable circular rack 22 which cooperates with a pinion 23 carried by a shaft 24. The shaft 24 is shown as driven through suitable beveled gears 25 and a reduction gear 26 by a motor 27.

With this arrangement it will be seen that when the motor 27 is energized it will rotate the table 17 about the vertical axis provided by the ball races 20 and 21 and thus carry any articles placed upon the table 17 through the annular inverted furnace chamber 10 in a continuous manner. The control of the motor 27 is not a part of our present invention. However, it will be sufficient to say that we contemplate providing suitable switching arrangements whereby the motor may operate to drive the table 17 continuously or we may provide a control equipment which will start and stop the motor intermittently with a step by step movement, so that a heated article may be removed and a cool one placed upon the table during the stationary period. The table 17 is shown in Fig. 1 as provided with suitable pots and wells 28 which are adapted to receive a depending shank 29 of a centrifugal mold 30 of the type previously referred to. In this figure of the drawings we have illustrated only two of these pots 28, omitting the remaining pots for the purpose of simplifying the drawings and preventing a confusion, owing to complication of the drawings. By referring to Fig. 2, however, it will be seen that these pots or wells 28 are arranged in equally spaced relation about the circumference of the table 17.

Gas supply

Connected with the bottom of the wells 28 we show suitable piping 31 which connects through a pet cock 32 with semi-circular manifolds 33 which extend around the outer circumference of and below the table 17. These semi-circular manifold pipes 33 are shown as connected through suitable feed pipe 34 and 35 with a gas supply pipe 36. The gas supply pipe 36 is disposed centrally within the pedestal 19 and at its upper end it is provided with a suitable free running gas connection 37 which permits a free rotation of the table while at the same time maintaining a gastight connection between the pipes 34 and 35 and the feed pipe 36.

For the purpose of controlling the flow of gas from the manifolds 33 to the wells and pots 28 we provide the valves 32 with a relatively large cross-shaped hand wheel 38, which when rotated through an angle of approximately 90 degrees will cause the valves to successively open and close, depending upon its position. At a point upon two of the legs 12 adjacent to the opening 14 we also provide suitable inwardly projecting pins 39 and 40 which control the opening and closing of the valves 32. The pin 39 is disposed at a point in advance of the opening 14 considered with respect to the movement of the table 17 and the pin 40 is located at a point beyond the opening. These pins 39 and 40 are also so located upon the legs 12 that they will engage one of the arms of the wheels 38 and cause one of the valves to be closed as its particular well or pot 28 approaches the opening 14 and to be again opened after the particular well has passed the opening 14.

In order to provide against the escape of gas from the furnace chamber except

through the flue 15 we form suitable upwardly projecting flanges on the top of the table 17 which are adapted to retain a suitable sand or other granular refractory material and projecting downwardly from the furnace body 10 there is provided suitable depending annular lips which engage with the sand upon the table 17 and provide an effective seal against the free escape of gases from the furnace during its operation.

Door operating mechanism

Arranged at the opening 14 and in the front face of the flue 15 we provide a pair of vertical hinged doors 41 which may be conveniently and quickly opened and closed for the purpose of removing and inserting the molds 30 into the furnace. These doors are shown as firmly secured upon vertical extending shafts 42 which carry beveled gears 43 upon their lower ends and associated with beveled gears 43 there are provided cooperating beveled gears 44 which are mounted upon a horizontally disposed shaft 45. Secured to the shaft 45 we show a suitable arm 46 which by means of a link 47 is connected with a foot pedal 48. The foot pedal 48 is also shown as biased in an upward or door closing position by means of a suitable spring 49 so that when the operator's foot is removed from the pedal 48 the spring 49 will operate to rotate the shaft 45 and thus by reason of the beveled gears 43 and 44 cause the doors 41 to again close.

Operation

The operation of our improved furnace is substantially as follows:

It will be assumed that the furnace is fully charged with a number of the molds 30 and that gas is being passed through all of the molds but the three immediately adjacent the opening 14 and that the furnace has been stopped for the removal of one of the heated molds 30. At this point the operator will depress the pedal 48 thus causing the doors 41 to open and with suitable tongs will then remove the heated mold and replace a cold mold in the vacant well. As soon as the cold mold has been replaced within the furnace he will remove his foot from the pedal 48 and allow the doors 41 to close. The operator will then start the motor 27 and rotate the table to bring the next heated mold into position for removal.

During the movement of the table 17 it will be seen that as valves 32 approach the pin 39 they will be closed and that when the same valve reaches the pin 40 it will be again opened so that during the time the molds either heated or cold lie between pins 39 and 40 the gas will be turned off and as a result an unnecessary waste of the gas will be avoided.

By properly timing the table 17 and providing a gas of suitable type we have found that it is possible to heat bronze bearing backings in the molds 30 to temperatures as high as from 500 to 600 degrees centigrade without a trace of oxidation occurring upon the molds. In practice we have found that where the speed of the table 17 and the temperature of the furnace chamber 10 are properly regulated that the most efficient operation of our furnace occurs when molds are passed through furnace only once.

While we have, for the sake of clearness and in order to disclose our invention so that the same can be readily understood, described in general terms and illustrated specific devices and arrangements, we desire to have it understood that this invention is not limited to the specific form disclosed but may be embodied in other ways that will suggest themselves, in view of this broad disclosure, to persons skilled in the art. It is believed that this invention is broadly new and it is desired to claim it as such so that all such changes as come within the scope of the appended claims are to be considered as part of this invention.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

1. A furnace for heating casting molds and like articles in a non-oxidizing atmosphere, comprising a stationary annular furnace body having a rotatable bottom, said bottom being provided with a plurality of gas outlets for supporting the molds and like articles to be heated, a heating means for said furnace body, a loading station at one point of said furnace body, means independent of said heating means for introducing a non-oxidizing gas through said gas outlets as the bottom of the furnace rotates, and means for controlling said non-oxidizing gas as said gas outlets approach and leave said loading station.

2. A continuously acting rotary furnace for heating casting molds and like articles in a non-oxidizing atmosphere, comprising an inverted annular furnace body having a relatively rotatable bottom and an opening for loading and unloading, said bottom being provided with a plurality of receptacles for receiving the molds and like articles, a means for heating said furnace body, means independent of said heating means for introducing a non-oxidizing gas into said receptacles as the bottom of the furnace rotates, and means operated by the movement of said furnace bottom for stopping the introduction of said non-oxidizing gas as said receptacles approach said loading and unloading opening in the furnace body.

3. In a continuously acting furnace the combination of an inverted furnace chamber having heating means therein, said furnace body having an opening for the withdrawal of the articles being treated, a horizontally

disposed movable bottom for said furnace, means carried by said bottom adapted to support the articles to be heated, gas conveying connections connected with said article supporting means, a flue associated with said furnace body adjacent to the opening where the articles are withdrawn, a normally closed door at said opening to prevent the escape of said non-oxidizing gas into the room, and means for automatically closing said gas supply connections when said article supports approach said opening.

4. In a continuously acting rotary furnace the combination of an inverted annular furnace chamber having heating means therein, said annular furnace body also having an opening at one point for the introduction and withdrawal of the articles being treated, a horizontally disposed rotatable annular bottom for said furnace, means carried by said bottom adapted to support the articles to be heated, gas conveying connections connected with said article supporting means, a normally closed door at said opening to prevent the escape of said non-oxidizing gas into the room, and means for automatically closing said gas supply connections when said article supports approach said opening and adapted to again open said gas supply connections after the article support has passed said opening.

5. In a continuously acting rotary furnace, the combination of an inverted annular furnace chamber having heating means therein, a horizontally disposed movable annular bottom for said furnace, means carried by said bottom adapted to support the articles to be heated, gas conveying conduits connected with said article supporting means, and means for periodically opening and closing said gas supply conduits as said furnace bottom moves.

6. In a furnace for heating articles under non-oxidizing conditions, the combination of an inverted annular chamber having heating means disposed therein, a horizontally disposed rotatable table below said annular chamber and cooperating therewith to form a substantially sealed furnace, a driving means for rotating said table with respect to said inverted annular chamber, and a plurality of gas outlets carried by said table for introducing a non-oxidizing gas into the furnace chamber at spaced points, and means for periodically opening and closing said gas outlets as said table rotates.

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